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DEVELOPMENT OF A LAUNCH SIGNATURE SIMULATOR FOR THE LAW ANTITAN--ETC(U)
SEP 78 I SPIESS, G C GRATKOWSKI

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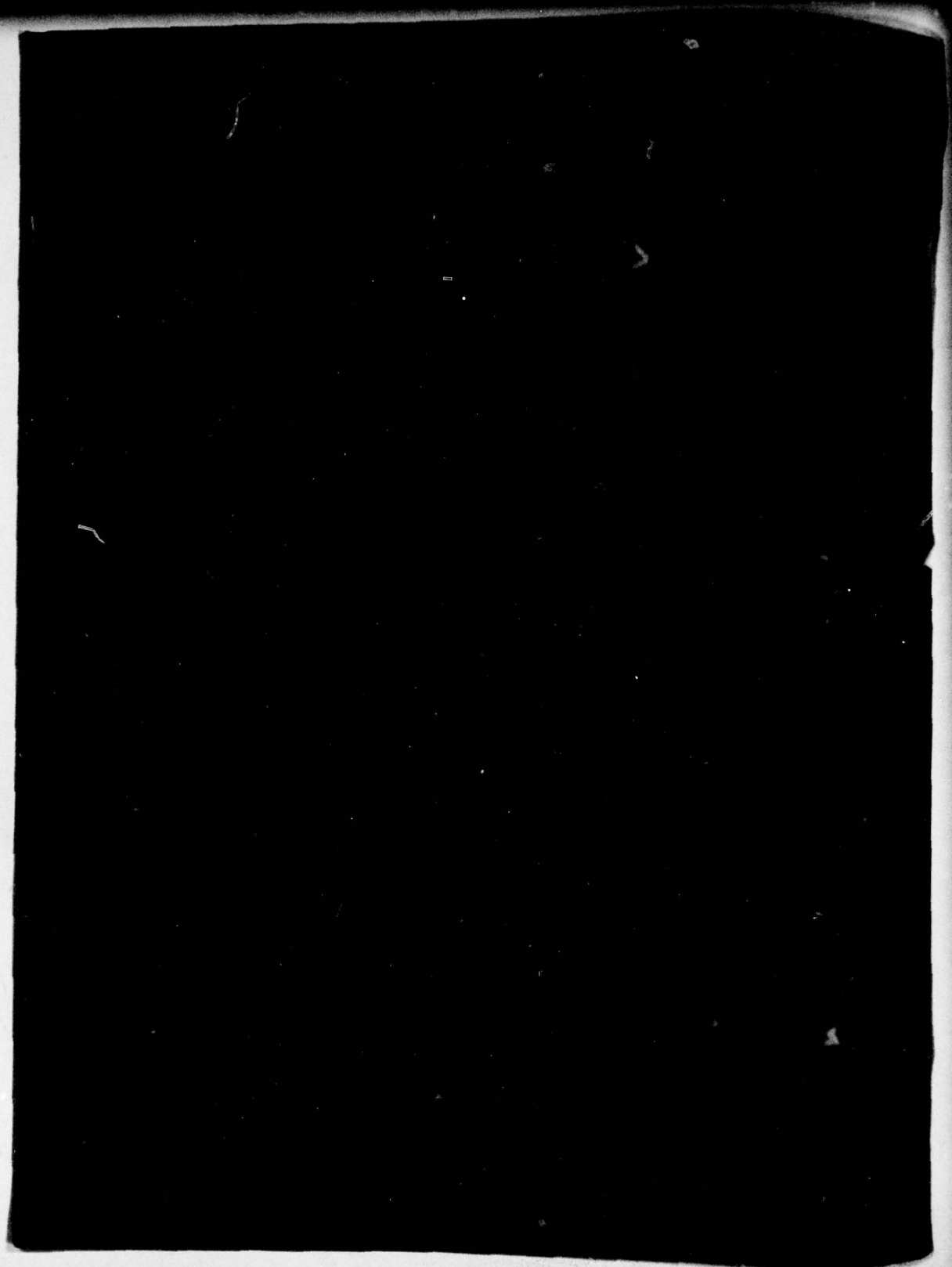

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(Tank versus Infantry in a Smoke Environment)

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Antitank missile
Rocket motor signature
Launch signature simulator (LSS)
Weapons effects signature simulators (WESS)
Training equipment
Operational exercises
Tactical experiments

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

ARRADCOM developed and provided to the Combat Developments Experimentation Command, for the TISE tactical experiment, a device that simulated the effects of launching a LAW antitank missile, but was safe to fire in the direction of a troop occupied area. It was based on the concept of launch signature simulators (LSS) previously developed for TOW, Dragon and Shillelagh missiles. Most components for the nonpropulsive firing units were cannibalized from available M73 practice →

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19. Key Words (continued)

Combat training
Engagement simulation
TISE (tanks versus infantry in a smoke environment)
Decoy

20. Abstract (continued)

rockets. The firing units were used in conjunction with modified M190 launchers. A highly realistic simulation of flash, flame, smoke, blast, and sound effects of the LAW missile firing was achieved. This concept could be used to develop inexpensive, one-shot, throwaway, type-classified, shelf items for operational exercises, training, decoys, or other applications requiring highly realistic simulation of missile firings without downrange hazards.

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INTRODUCTION

The Combat Developments Experimentation Command (CDEC), while planning a tactical experimental operation designated TISE (tanks versus infantry in a smoke environment), identified a need for a device that would simulate the effects of launching a light antitank weapon (LAW) missile, but would be safe to fire in the direction of an area occupied by troops. Beginning in January 1977, inquiries about a LAW simulator were made of Picatinny Arsenal (now ARRADCOM) personnel who previously conceived, designed, developed, and provided, to CDEC, launch signature simulators (LSS) for the TOW, Dragon and Shillelagh antitank missiles for use in operational exercises with requirements similar to TISE. None of the previously developed devices were suitable for simulating the launch of a LAW missile. Prior to these inquiries, there had been no indication of a need for a LAW LSS. The M73, 35-mm, subcaliber, practice rocket, normally used to train LAW gunners in firing the missile, could not have been used for TISE because the 35-mm rocket was projected downrange with enough force to easily kill a man if it hit him. In any event, its launch signature was not powerful enough to effectively simulate a LAW missile launch. It was decided that an effective LAW LSS could be developed analogous to the previously developed antitank missile simulators.

In April 1977, CDEC requested ARRADCOM to submit a proposal for designing, developing, and furnishing 1500 LAW LSS units together with sufficient launchers for firing them from ten launch positions in groups of two shots in rapid succession, to support a program scheduled to commence in late July. The short lead time required that the approach taken include the following features:

- Maximum use of standard, available components
- Maximum safety factors in design, to preclude lengthy optimization and testing.
- Full utilization of technology proven in previous work.

A design was worked out, based on the technology previously developed for the TOW and Dragon LSS, using the basic hardware, propellant, and igniter of the M73, 35-mm, subcaliber, rocket propulsion system and the M190 launcher. Modification and assembly techniques were worked out. A test program to demonstrate the validity of the design and its safety was

planned. CDEC approved the program and provided funding in June. The entire development and test program was carried out in 7 weeks. At the end of July, the ARRADCOM engineering support team arrived at Hunter-Liggett Military Reservation (HLMR), set up a loading and assembly facility, assembled 985 LAW LSS rounds to fulfill CDEC's revised requirements, and trained the using troops in deployment and firing of the LAW LSS. Comparison tests showed that the LAW LSS successfully simulated the LAW antitank missile (ref. 1). During the TISE exercise, 677 of the prepared rounds were fired. The remaining assembled units and hardware were retained to meet future CDEC requirements.

DESIGN CONCEPT

The basic design concept of a device giving rise to all the effects of launching a missile, including flash, flame, smoke, blast, and sound, that is safe to fire from the shoulder (as are LAW and Dragon) or from a lightly supported launcher (as is TOW), and, yet, projects nothing downrange that would present a hazard to troops occupying the target area, was conceived and worked out in the development of the Dragon and TOW LSS. It consists of a firing unit which vents its exhaust gases equally in two axially opposed directions. As a result, the thrusts generated by the exhaust streams exactly balance each other. The firing unit contains the same propellant charge as the tactical propulsion system being simulated. Alternatively, it can contain a modified propellant charge designed to bias the effects in some desired direction or minimize expense. It is completely nonpropulsive, but generates all the effects of a tactical system launch without moving itself or propelling any projectile in either direction. Only two, small, light, plastic nozzle closures leave the firing unit.

Because of the scheduling for the TISE operation, only 7 weeks were available to develop the LAW LSS. There was no time to design and fabricate special hardware, propellant, or igniters. However, it was determined that M73, 35-mm, subcaliber, practice rockets, normally used to train LAW gunners, were available at HLMR together with expended LAW launchers. Adaption kits to modify expended LAW launchers and produce M190 launchers were available at Letterkenny Depot. Mating two of the M73 rocket propulsion units to a central coupling, such that the nozzles of the propulsion units were in direct opposition, produced a firing unit analogous to the Dragon and TOW LSS firing units. In this case, the propellant charge consisted of six sticks of the same propellant used in the LAW missile, or 32% of the LAW charge. This proportion was similar to the TOW LSS, which used 33% of the charge of the tactical TOW propulsion unit. Since the LAW and TOW simulators exhaust both to the front and

rear, rather than only to the rear as in the LAW and TOW tactical missiles, this scaling factor was considered to be directly in line with demonstrated satisfactory experience. In practice, it was found that a total of five propellant sticks, or 26% of the LAW charge, gave rise to a more credible signature in the total configuration of the LAW LSS.

FIRING UNIT

Since the M73, 35-mm, subcaliber, practice rockets (fig. 1) were available in sufficient quantities, it was only necessary to remove the forward parts by unscrewing the head and closure assembly to provide the propulsion system components required for the LAW LSS (fig. 2). It was also necessary to provide a central coupling to mate the two propulsion systems in opposition to each other. The propellant assemblies were suspended with sufficient spacing to permit free movement of exhaust gases from one end of the firing unit to the other. This was essential to assure proper ignition, uniform pressure throughout the firing unit, and division of the exhaust gases into two equal streams.

The LAW propellant grain assembly (fig. 3) consists of a tubular stick of M7 propellant adhered to a plastic jacketed pin. This assembly is supported by a suspension plate, shown in figure 4. The propellant stick passes through the holes in the suspension plate. The head of the support pin engages the plate to prevent rearward motion. When the suspension plate is held between the motor case and the forward closure, either in the M73 or the LAW missile, the propellant support pins are prevented from forward motion by the closure itself, and there is no space for the gases to pass freely forward around the suspension plate. For the LAW LSS, it is necessary not only to provide space for free circulation of the exhaust gases around the suspension plate, but also to secure the propellant support pins from forward motion.

The coupling (fig. 5) was designed to provide sufficient standoff of the suspension plate from the motor tube and sufficient space around the suspension plates to permit free passage of the gases. In effect, the coupling incorporated a plenum chamber to permit proper gas flow. In addition to these considerations, the coupling was designed to be simple to fabricate, so that it could be obtained in a short time.

The suspension plates were placed back to back. This held both sets of propellant support pins in proper position. A clip (fig. 6) was designed, which engaged the slots in the suspension plates. It locked

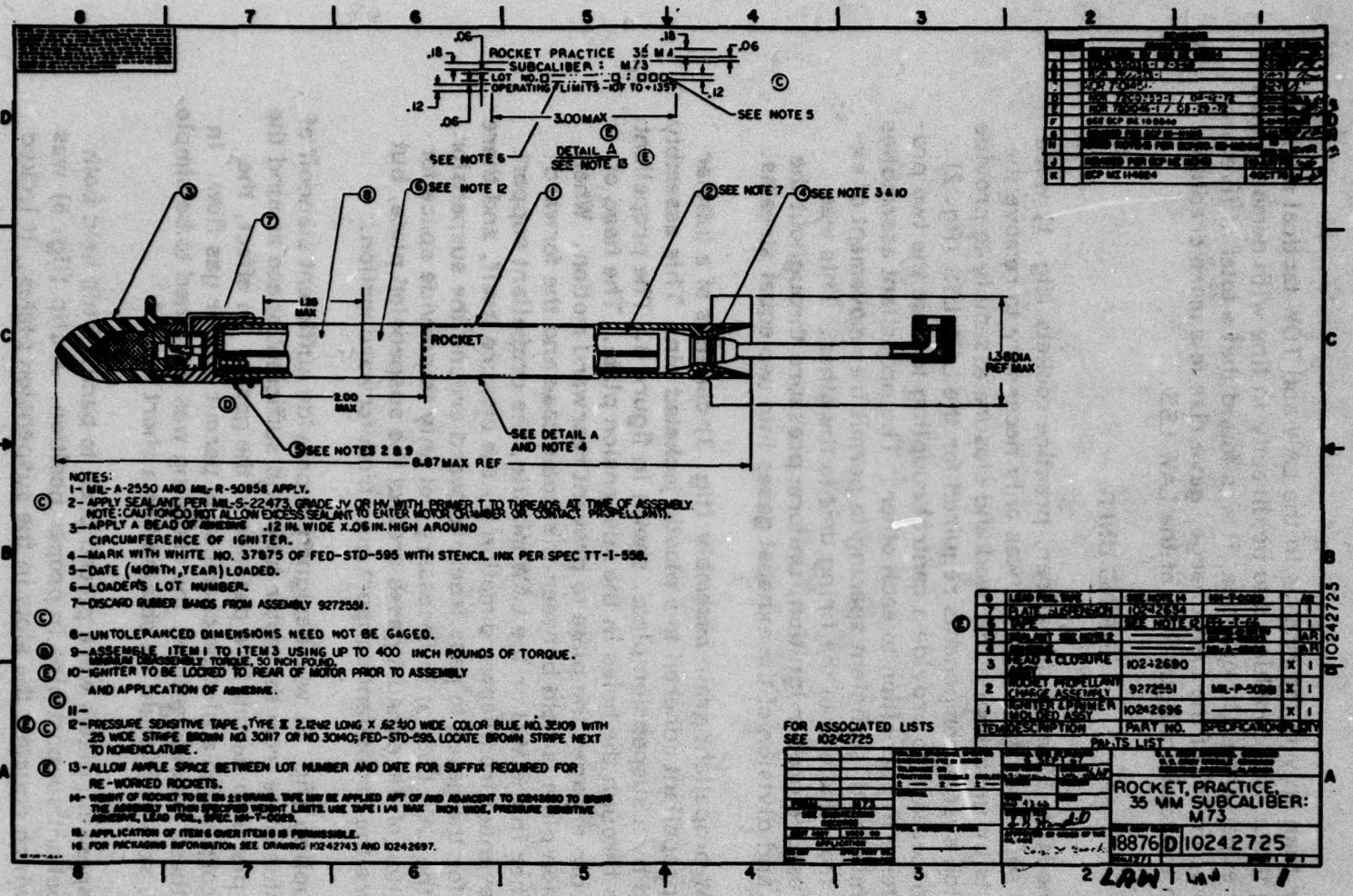
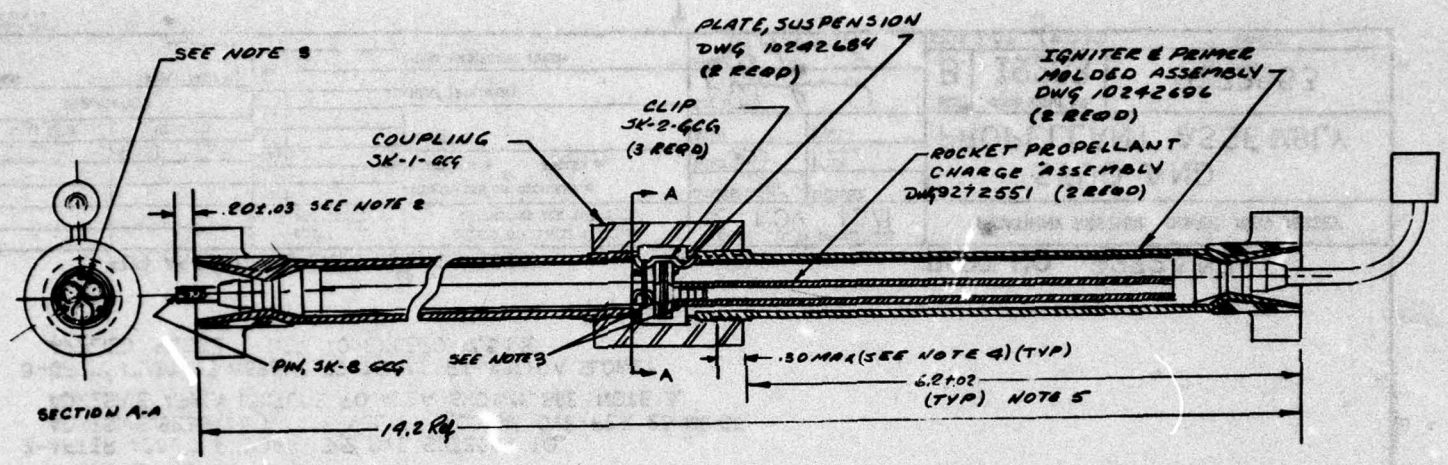


Figure 1. Rocket, practice, 35-mm subcaliber, M73.



NOTES:

1. MIL-A-8550 APPLIES
2. MODIFY AS SHOWN AND INSERT PIN 3K-8-GCG.
3. TIE CLIPS AS SHOWN WITH LOCK WIRE MS-20995-11-20 .020 SIZE.
4. APPLY SEALANT LOCTITE 222 OR EQUAL TO THREADS AT TIME OF ASSEMBLY (DO NOT ALLOW EXCESS SEALANT TO ENTER COUPLING CHAMBER)
5. ASSEMBLE IGP MOLDED ASSY TO COUPLING TO DIMENSION SHOWN

LAW LAUNCH SIGNATURE
SIMULATOR LOADING
ASSEMBLY
3K-10
7-8-77 GCG

Figure 2. LAW launch signature simulator loading assembly.

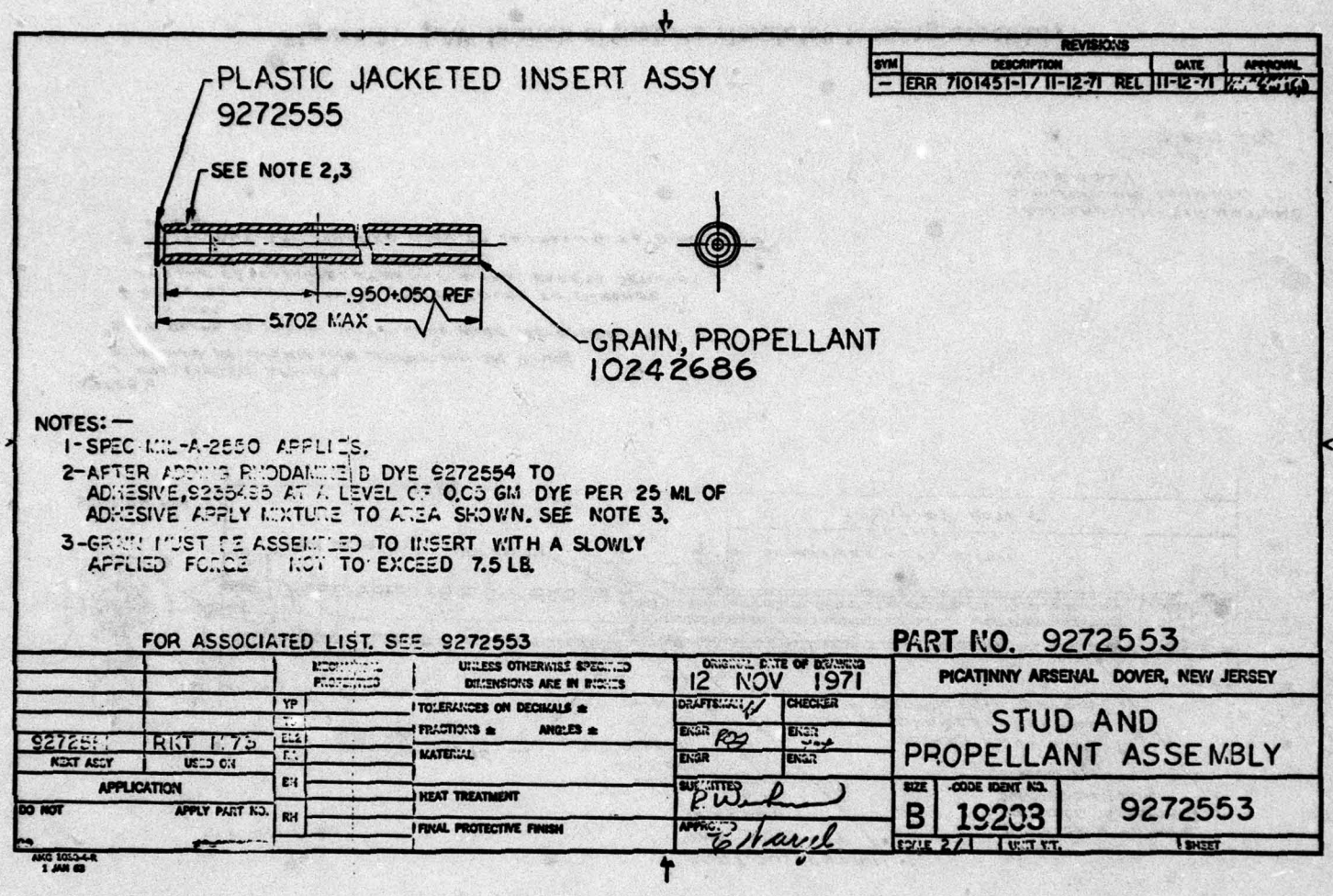


Figure 3. Stud and propellant assembly, RKT-M73.

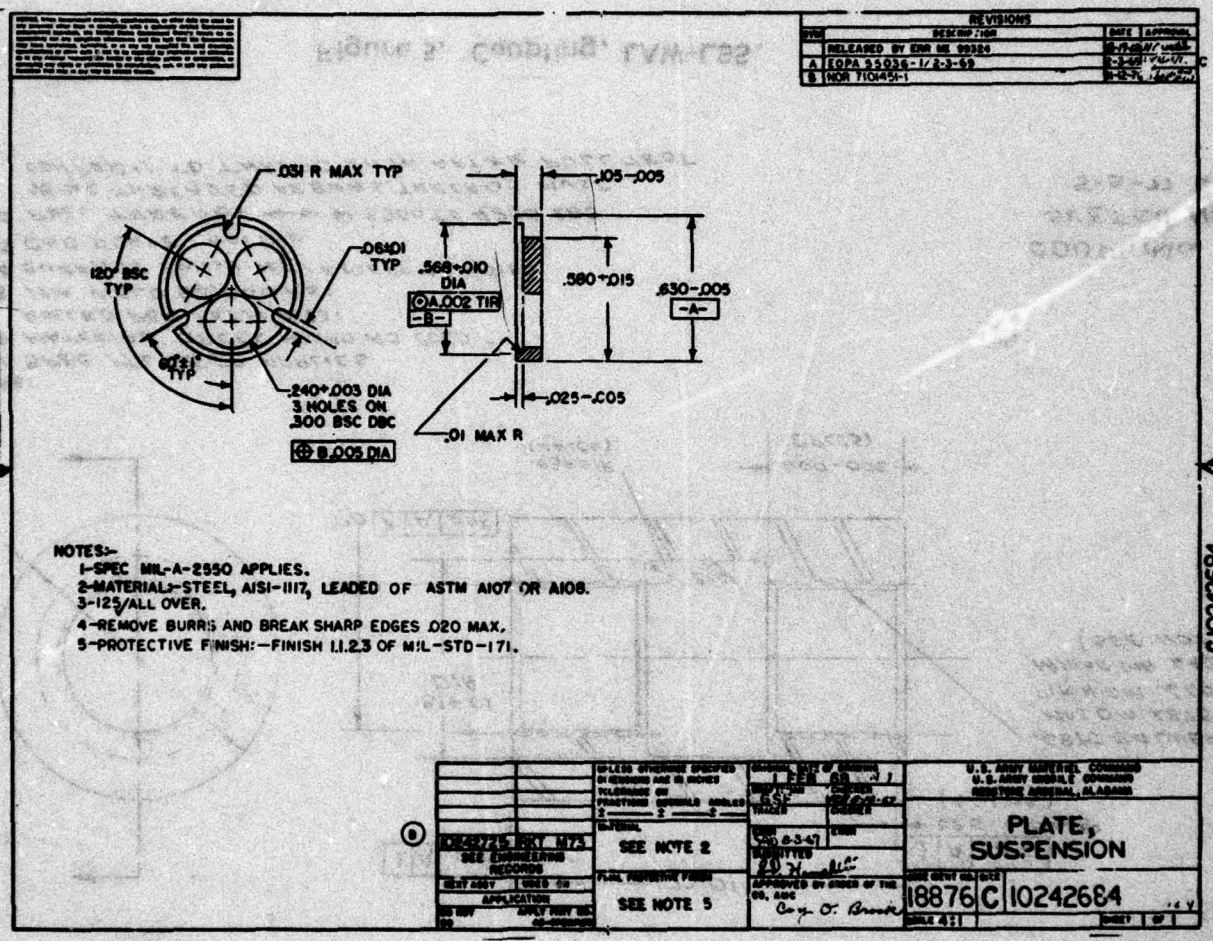
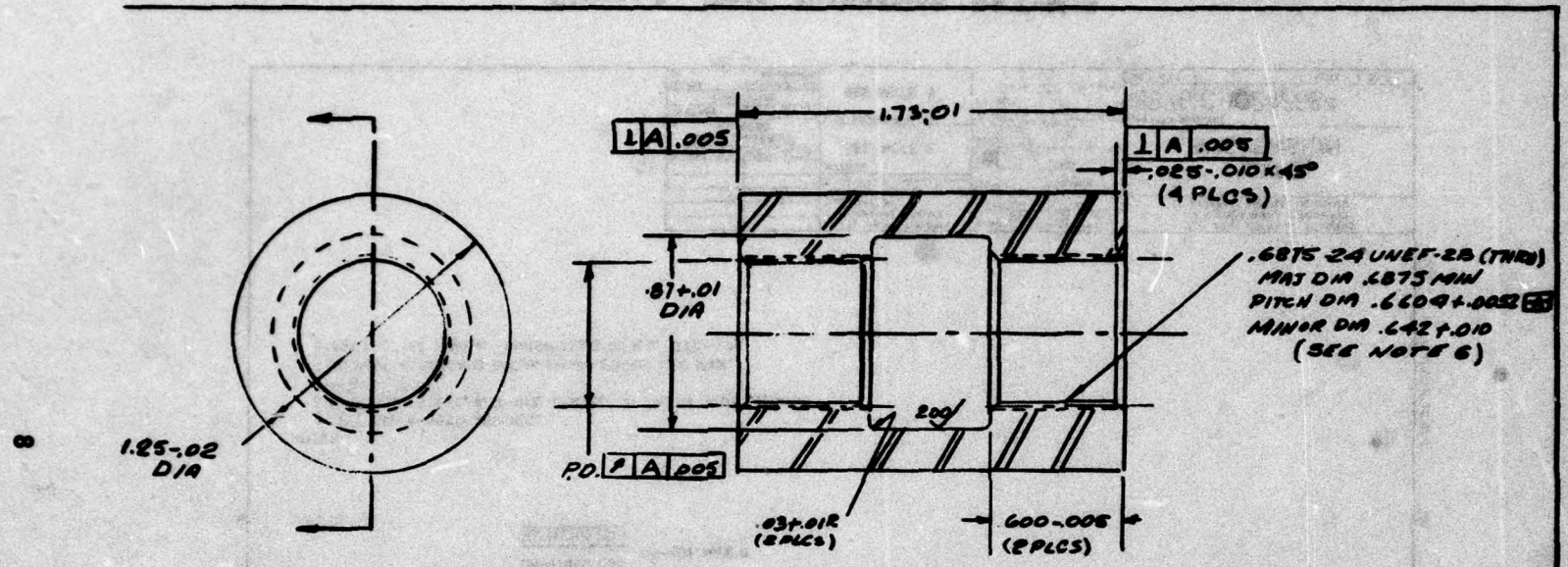


Figure 4. Plate, suspension, RKT-M73.

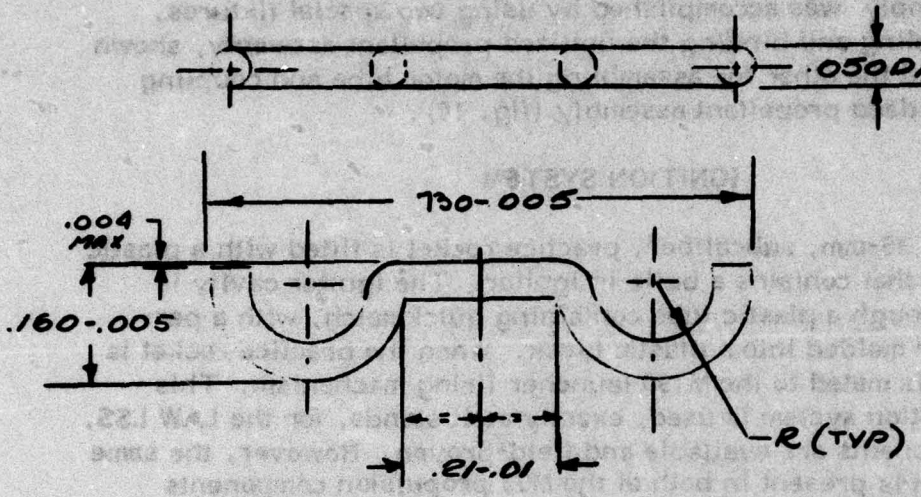


NOTES:

1. SPEC MIL 2550 APPLIES
2. MATERIAL STEEL 41L40 AS COLD ROLLED PER ASTM A331
3. MIN YIELD 98,000 PSI
4. SURFACE FINISH 125 EXCEPT AS NOTED
5. CAD PLATE .001 THK
6. PULL THREADS ⟷ @ 3900 TO 4200 LBS USING THREADED ARBORS. THREADS MUST CONFORM TO THREAD DATA AFTER PULL TEST

COUPLING
SKETCH NO 1
5-3-77 GGG

Figure 5. Coupling, LAW-LSS.



NOTES:
1. SPEC MIL-A-2550 APPLIES
2. MATERIAL: STEEL CRES 300 SERIES

CLIP
SKETCH NO2
5-3-77 GGG

Figure 6. Clip, LAW-LSS.

the suspension plates together, provided for their proper standoff from the motor tube, and positively positioned the components with respect to the plenum chamber designed into the coupling. Since the suspension plate had three slots (fig. 4) three clips were provided for each firing unit. This arrangement permited the entire assembly to be bound together with two wire loops holding the clips in place, thus securing the propellant assembly as a unitized component (fig. 7) which may be quickly and efficiently assembled into the firing unit (fig. 8) Assembly was accomplished by using two special fixtures, one for assembling and binding the unitized propellant assembly, shown in figure 9, and the other for assembling the motor tube and coupling around the unitized propellant assembly (fig. 10).

IGNITION SYSTEM

Each M73, 35-mm, subcaliber, practice rocket is fitted with a plastic nozzle closure that contains a built-in igniter. The igniter cavity is connected, through a plastic tube containing quickmatch, with a percussion primer molded into a plastic block. When the practice rocket is to be fired, it is mated to the M190 launcher firing mechanism. This firing and ignition system is used, exactly as it stands, for the LAW LSS, since all components are available and field-proven. However, the same ignition system is present in both of the M73 propulsion components sets that comprise the LAW LSS firing unit. It is necessary to have a matching nozzle closure at the forward end of the firing unit to seal the unit and assure proper pressure build-up during ignition. But it is not desirable to have the primer block and the quickmatch tube in the forward end because it might cause confusion in mating the firing unit to the launcher and useless debris would also be expelled from the forward end of the launcher. It was decided to cut off the quickmatch tube and the primer block from one end of the firing unit. This made it necessary to protect the igniter from exposure to moisture and contamination and to prevent it from leaking igniter material.

Various techniques to seal the tube were considered. The overriding considerations were rapidity and ease of handling under the assembly conditions at HLMR as well as instant readiness of the sealed unit. These requirements were met by a press fit plastic pin (fig. 11) which was inserted into the cut-off tube with the aid of a thumbtack-like head. After insertion, the head was cut off so the plug was flush with the end of the tube. This was rapidly installed and provided an excellent seal that could not be removed by tampering. Tests proved that the forward igniter invariably fired before being ejected, minimizing the resulting debris and assuring that there was no hazard caused by remains of unfired igniters in the operating area.

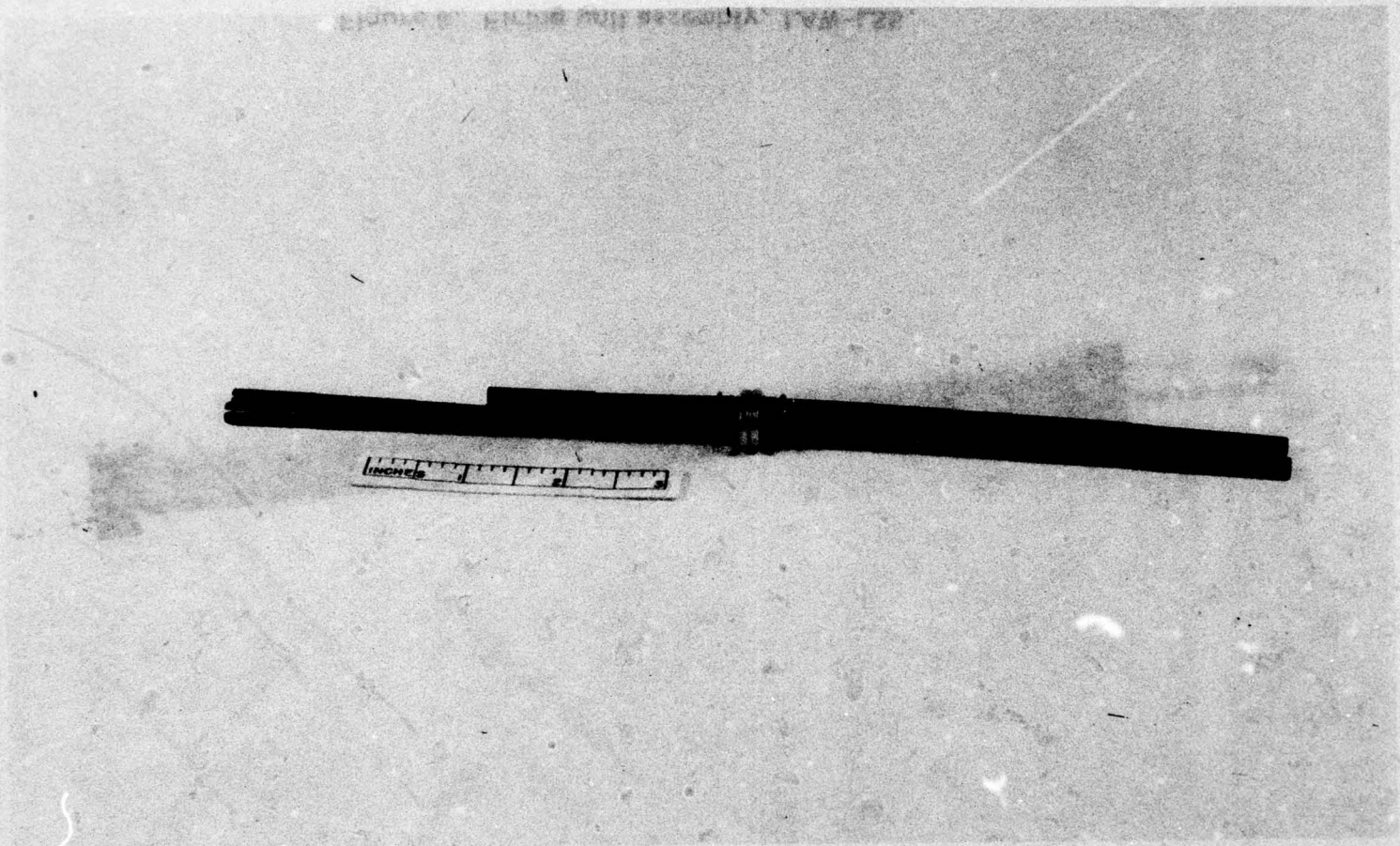


Figure 7. Propellant charge assembly, LAW-LSS.

Figure 8. Firing unit assembly, LAW-LSS.

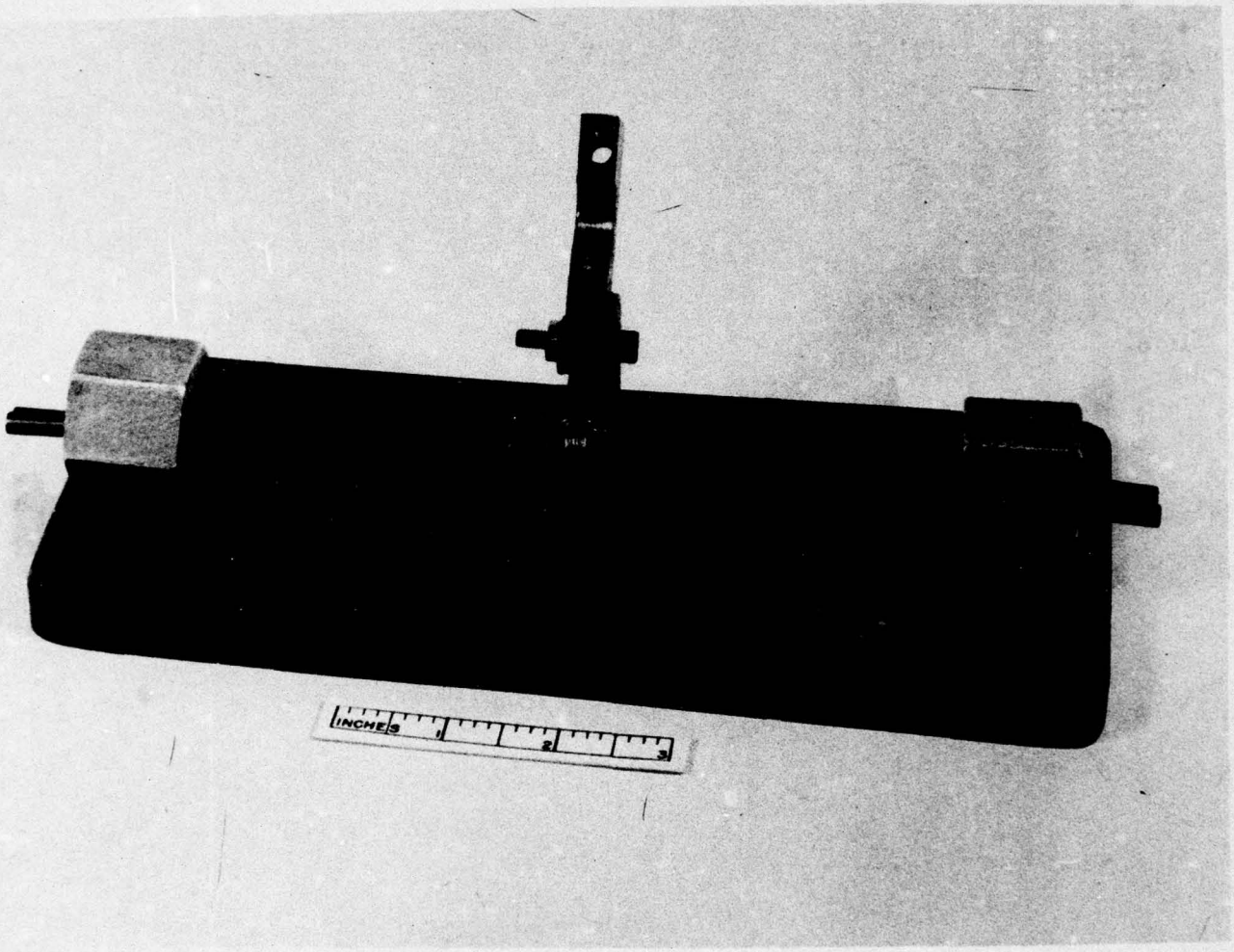


Figure 9. Propellant charge assembly fixture, LAW-LSS.

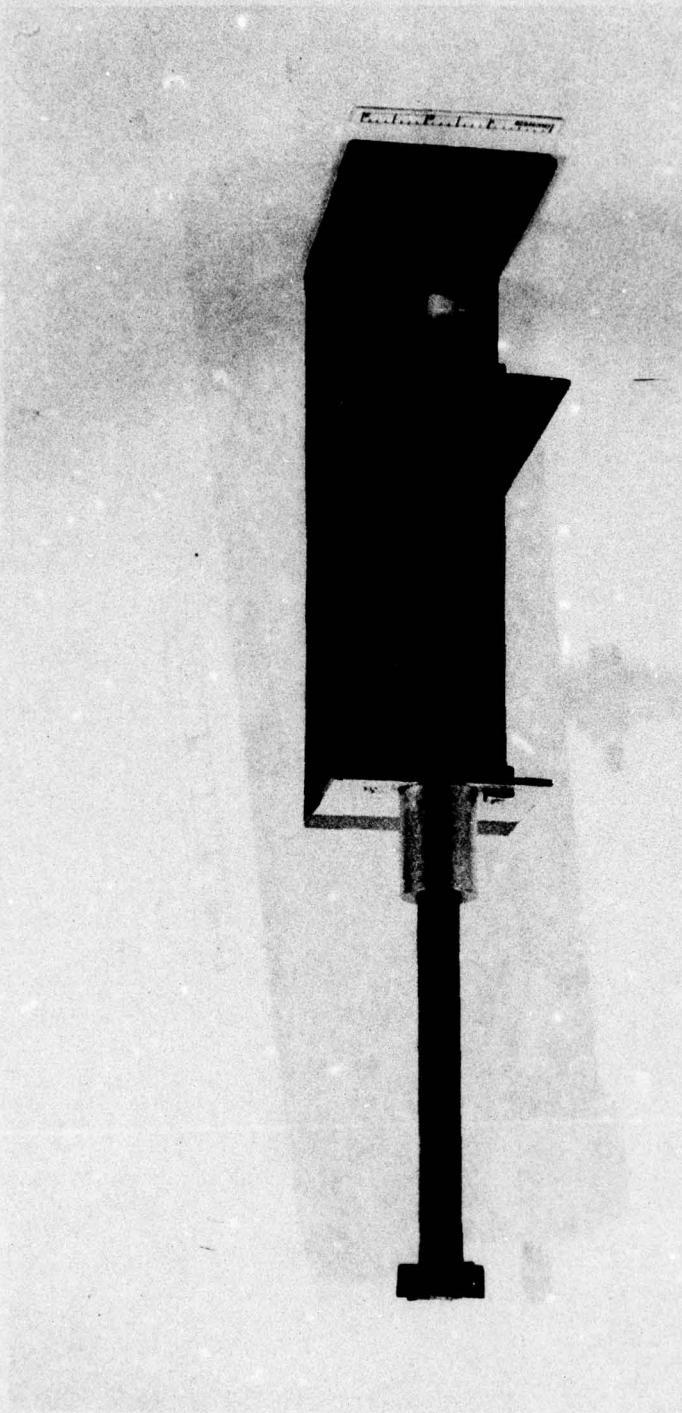
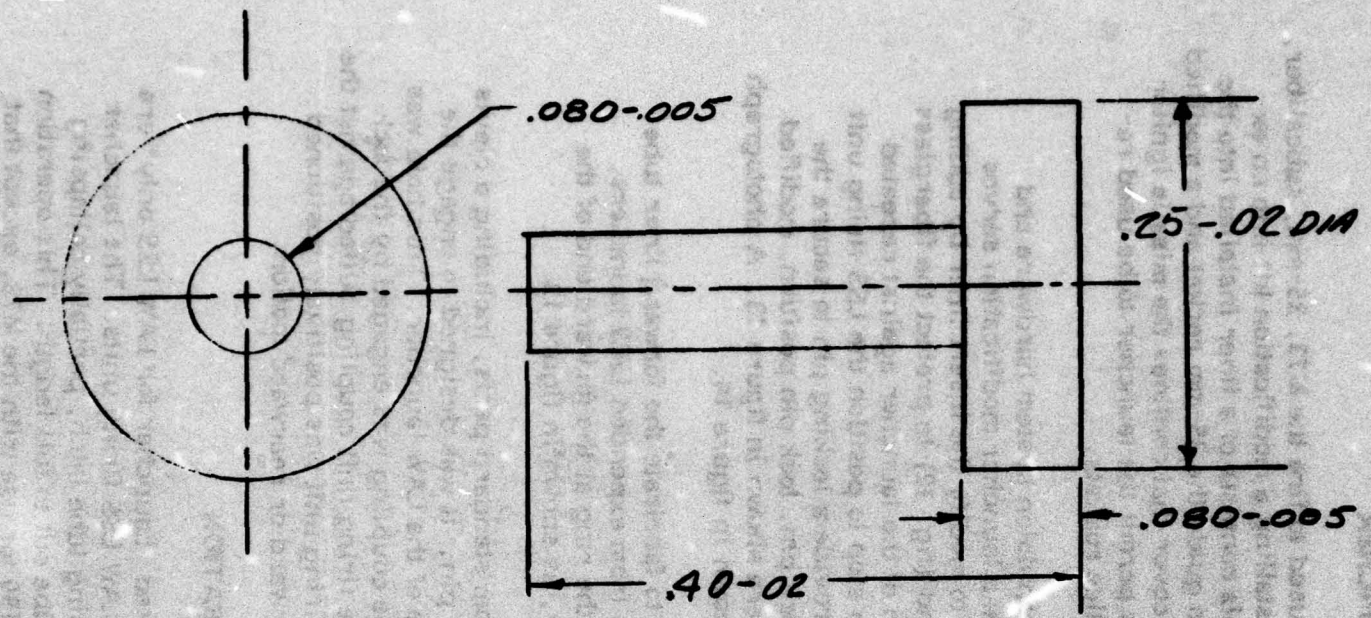


Figure 10. Firing unit assembly fixture, LAW-LSS.



NOTES:

1. SPEC MIL-A-2550 APPLIES.
2. MATERIAL:- PLASTIC MOLDING AND EXTRUSION MATERIAL, POLYETHYLENE AND COPOLYMERS (LOW, MEDIUM, AND HIGH DENSITY) CLASS L, TYPE 1, GRADE 1 OR 2 PER L-P-390.

PIN
3K-B
5-11-77 CLE

Figure 11. Pin, LAW-LSS.

LAUNCHER

The standard M190 launcher, used to fire the M73, 35-mm, subcaliber, practice rocket, is prepared by installing a modification kit into an expended tactical LAW launcher. This consists of a liner installed into the rear portion of the launcher tube to guide the 35-mm rocket and a modified swivel closure door to replace the cover that confines the missile igniter primer block. These modifications permit the launcher to be used repeatedly with a succession of practice rockets.

Since the LAW LSS uses the propulsion system hardware and igniter of the 35-mm rocket, the same launcher modification serves equally well. It is only necessary to modify the insert liner by adding an extension tube to the forward end (fig. 12) to protect the fiberglass reinforced-plastic forward section of the launcher against repeated firing of the LAW LSS, to provide a stop to position the LSS firing unit properly in the launcher, and to provide a locking pin to secure the firing unit in the launcher. The lock pin, lock pin position, modified launcher assembly, and markings are shown in figure 13. A photograph of the modified M190 launcher is shown in figure 14.

It proved to be most expedient to fabricate the forward liner tube by adapting rear inner tubes taken from expended LAW launchers. These tubes were then fastened to the ring at the forward end of the M190 launcher inner tube assembly, as shown in figure 12.

The lock pin was fabricated from standard parts, including a clevis pin, washers, a spring, and a roll pin. It was designed to engage the slotted hole formed in the rear tube of the LAW launcher. This hole was positioned so the rear surface of the coupling was engaged by the lock pin when the forward surface of the firing unit coupling butted against the stop in the liner tube. Thus, the firing unit was positively positioned and locked into place to prevent forward or rearward motion.

OPERATION

Modified M190 launchers, marked "Launcher for LAW LSS only" are provided together with assembled LAW LSS firing units. The launcher is cocked by releasing the telescoping tube latch, partially collapsing the tube, and then extending the tube out to full length. This operation is identical to the cocking of the M190 for use with the M73, except that it is not necessary to collapse the tube beyond the position for inserting the lock pin. After the launcher has been cocked, the LAW LSS firing

unit is inserted into the rear of the inner tube; the end with the cut-off primer block being inserted first. The firing unit is pushed into the tube until it is seated against the stop. It may be necessary to rotate the firing unit a few degrees either way to maneuver the forward fins past the stop. When the unit is properly seated, the primer block is in position to be mated to its seat in the primer housing on the launcher. The lock pin is inserted into its position in the launcher to lock the firing unit in place and rotated to align the pin handle with the markings on the launcher. After the lock pin is seated, the primer block is positioned in the launcher primer housing, as is done with the M73. Figure 15 is a sketch showing the arrangement of the firing unit mated to the launcher. Figure 16 is a photograph showing the firing unit in place in the modified M190 launcher, ready to fire. To fire, the safety bar is moved to the "arm" position and the trigger is depressed, the same as on the M73.[1]

After firing, the lock pin is removed and the firing unit is pulled out of the inner tube. The launcher is prepared for the next firing by removing the spent primer block from the primer housing, exactly as is done with the M73, and recocking. It is recommended that the safety bar be depressed towards the "safe" position before the launcher is recocked to prevent damage to the launcher firing mechanism. When the launcher is not to be refired immediately or is to be transported or stored, it is recommended that it be left in a partially extended position to protect the inner tube extension.

It is also recommended that the safety fan prescribed for the M72 LAW or M73 practice rocket back-blast be observed at both ends of the LAW LSS. Beyond this, the item is safe to fire in the direction of troops, because no missile is projected from the launcher. In the event of a misfire, the same procedure should be followed as prescribed for the M73.

[1] Directions on the use of the M190 and M73 are contained in references 2 and 3.

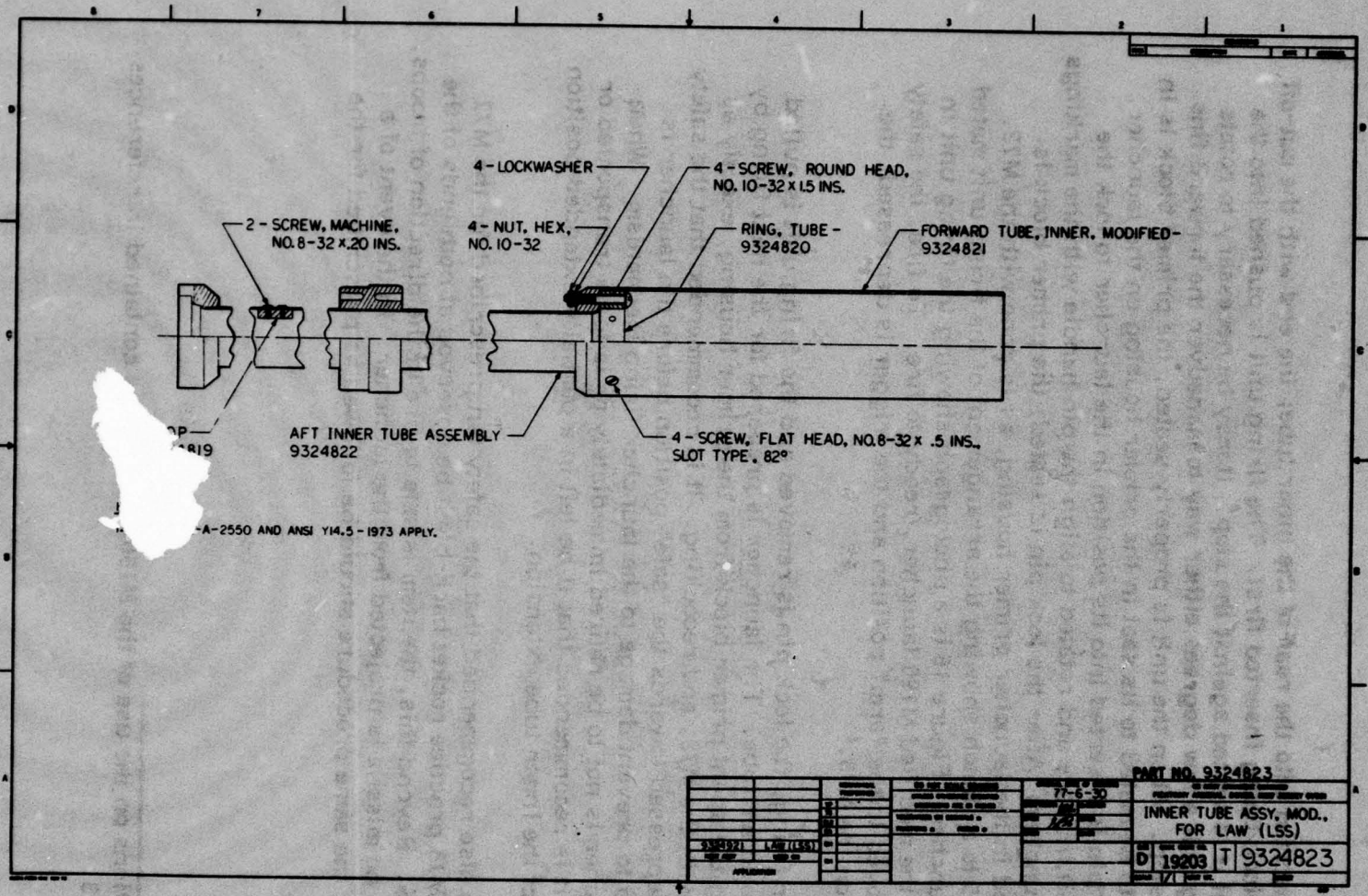
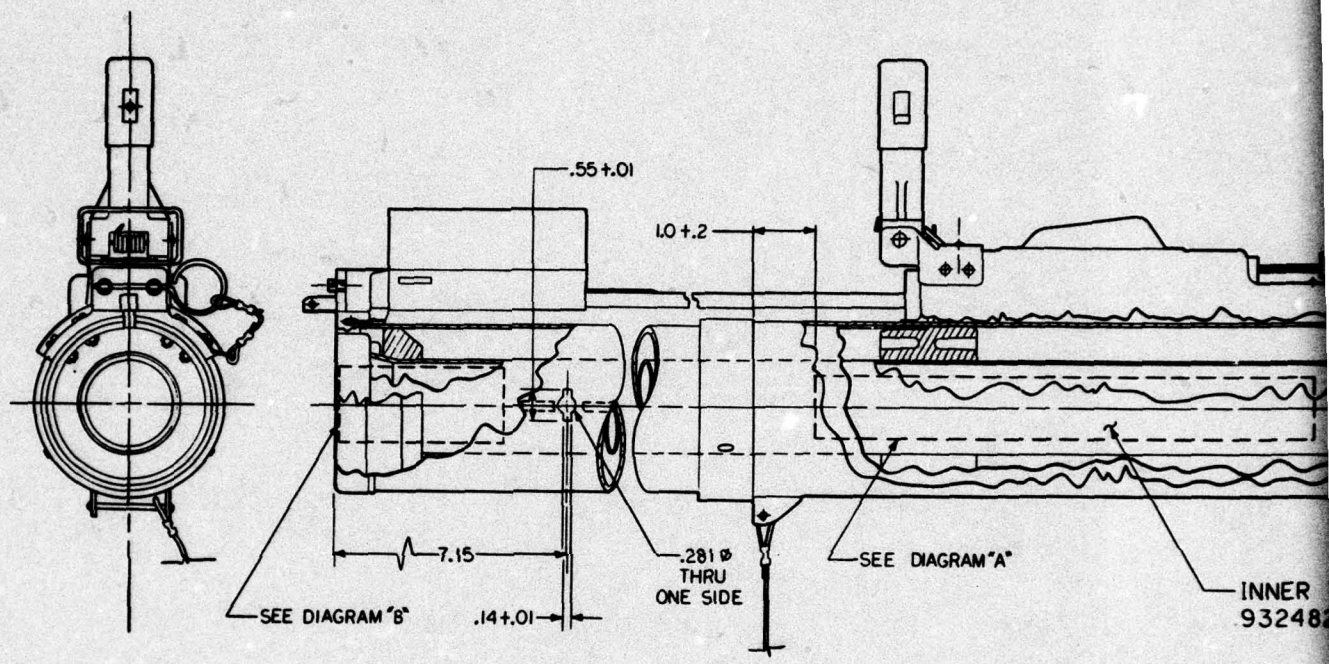
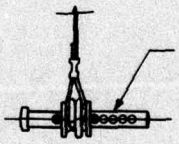


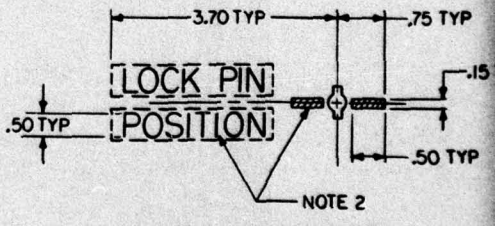
Figure 12. Inner tube assembly, modified for LAW-LSS.



NOTES:-

1.- SPEC MIL-A-2550 AND ANSI Y14.5-1973 APPLY.
2.- INSERT NOMENCLATURE SPECIFIED USING INK, STENCIL, TYPE I, COLOR, YELLOW NO. 33538, SPEC TT-I-1795.





MARKING DIAGRAM "B"
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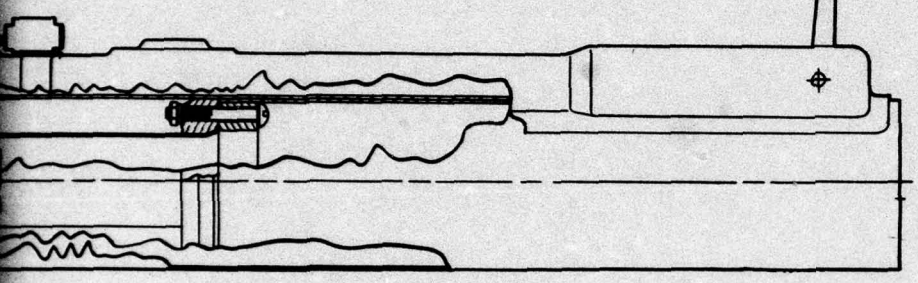
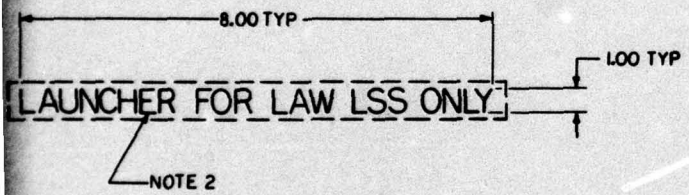
Figure 13. LAW, launch signature simulator, laun



TUBE ASSY, MOD., FOR LAW (LSS) -
23



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PART NO. 9324921

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TS	DIMENSIONS ARE IN INCHES	FINISH	FINISH		
EL2	TOLERANCES ON DECIMALS ±	FINISH	FINISH		
RB	FRACTIONS · ANGLES ±				
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BN					
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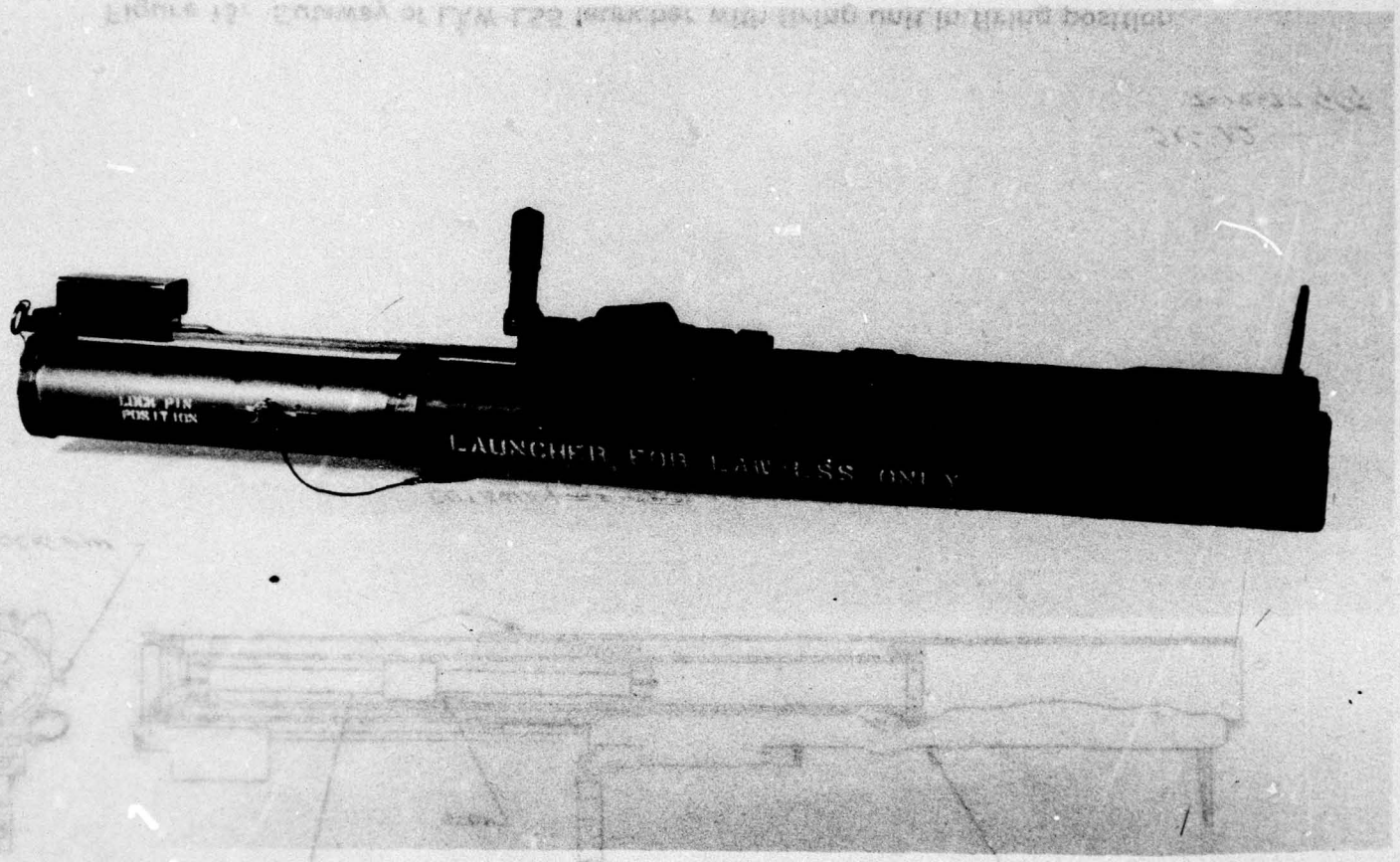
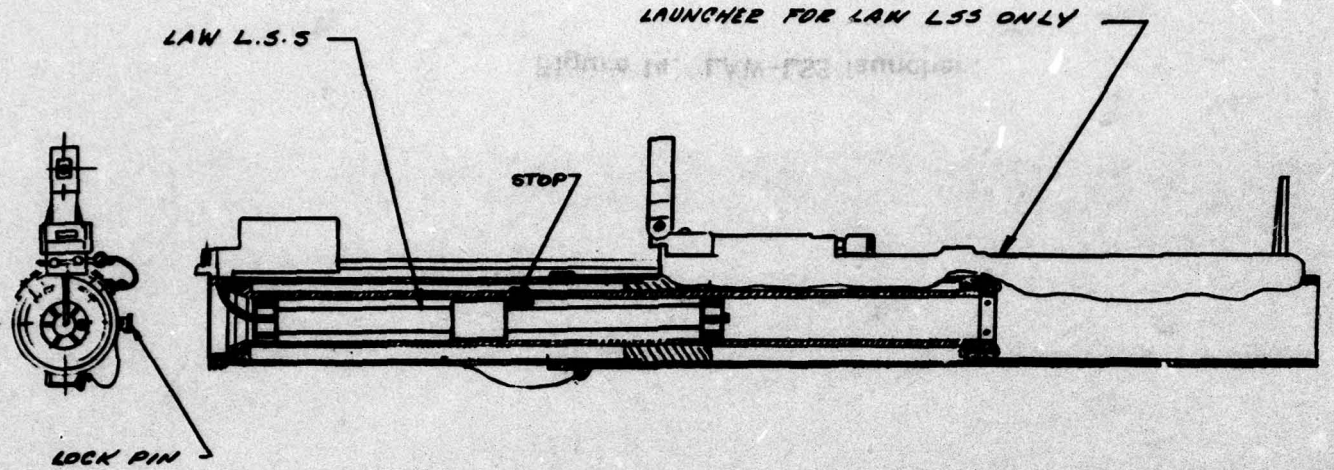


Figure 14. LAW-LSS launcher.



CUTAWAY OF LAW LSS LAUNCHER
WITH LAW LSS IN FIRING POSITION

JK-12
7-12-77 GCS

Figure 15. Cutaway of LAW-LSS launcher with firing unit in firing position.

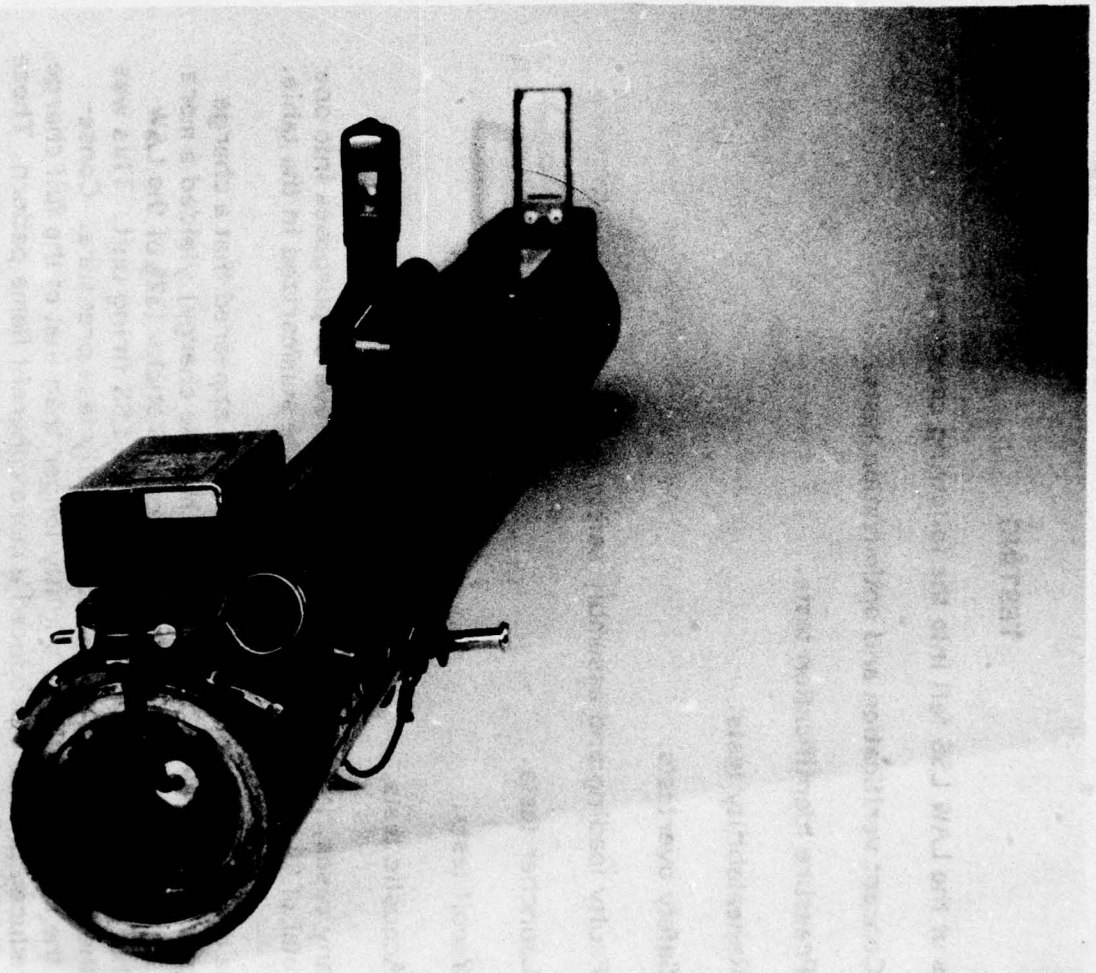


Figure 16. LAW-LSS launcher showing firing unit in firing position.

TESTING

Tests of the LAW LSS fell into the following categories:

Concept verification and optimization tests.

Pressure identification tests.

Repeatability tests.

Safety overtests.

Faulty loading and assembly safety tests.

Launcher tests.

Recoil tests.

Acoustic tests.

In many cases, it was possible to combine several purposes into one test. A total of 84 tests were conducted and are summarized in the table.

In the earliest concept verification tests, it appeared that a charge of 5 sticks of propellant (26% of the LAW missile charge) yielded a more credible signature than the maximum charge, 6 sticks (32% of the LAW missile charge) capable of being loaded in the LSS firing unit. This was because the reduced charge generated slightly less pressure. Consequently, the burning time was slightly longer than that of the full charge, and the reduced pressure produced a more coherent flame pattern. These effects gave the impression of a better simulation of the LAW missile to a distant observer. The reduced charge was adopted for the LSS, although tests with the full charge were performed throughout the entire program to verify its safety.

In order to monitor pressure, test couplings were prepared with a tap to accommodate pressure instrumentation. After pressure information was established and verified, tests were conducted with uninstrumented couplings to verify the performance of the system as it was fielded.

Table 1. LAW launch signature simulator tests.

Number of tests	Charge configuration	Test temperature	Instrumentation	Test purpose
2	Full	Ambient	Pressure	Concept verification
2	Reduced	Ambient	Pressure	Concept verification
2	Full	Ambient	None	Concept verification and optimization and launcher test
2	Reduced	Ambient	None	Concept verification and optimization and launcher test
13	Full	Ambient	Pressure	Pressure baseline and repeatability
10	Reduced	Ambient	Pressure	Pressure baseline and repeatability
2	Full	Ambient	Pressure	Instrumentation check
2	Reduced	Ambient	Pressure	Instrumentation check
3	Full	135°F	Pressure	Safety overpressure check
2	Reduced	135°F	Pressure	Safety overpressure check
2	Full	145°F	Pressure	Safety overpressure check
2	Reduced	145°F	Pressure	Safety overpressure test
10	Full	160°F	Pressure	Safety overpressure and repeatability test
10	Full	160°F	None	Safety overpressure test and final component check
3	Propellant components omitted	Ambient	Pressure	Faulty loading test
3	Full	Ambient	Calibrated pendulum and sound pressure	Recoil and acoustic measurements, launcher test
3	Reduced	Ambient	Calibrated pendulum and sound pressure	Recoil and acoustic measurements, launcher test
4	Unbalanced propellant charges	Ambient	Calibrated pendulum and sound pressure	Faulty loading test, recoil and acoustic measurements, launcher test
4	Full	Ambient	Sound pressure	Acoustic measurements and launcher test
3	Reduced	Ambient	Sound pressure	Acoustic measurements and faulty launcher assembly (lock pin omitted)

The maximum pressure encountered at ambient temperature for the full charge LAW LSS was 8550 psi. At 135°F, the maximum temperature for which the M73 was qualified, the maximum pressure for the full charge LAW LSS was 8900 psi. To overtest this item for safety, firings at 145°F and 160°F were also conducted, and the maximum pressures encountered for the full charge LAW LSS were 9200 psi and 10,600 psi, respectively. Tests conducted with the reduced charge unit yielded lower pressures than those encountered with the full charge under all conditions.

The closure for the standard M73 is 100% tested to a pressure of 12,000 psi in normal production. To conform to this, the coupling for the LAW LSS is also 100% tested to an equivalent pressure of 12,000 psi. This represents a considerable safety factor over the pressures encountered in firing.

The full charge LAW LSS was fired three times at 135°F, two times at 145°F, and ten times at 160°F with instrumentation. In addition to instrumented firings, ten firings of the full charge LAW LSS were conducted at 160°F with uninstrumented couplings. These tests showed that with a full charge at extremely high temperature, the LAW LSS was still within the pressure limits specified as safe for the components.

To demonstrate that an error in loading the reduced charge would have no adverse effects, three tests were conducted at ambient temperature with propellant components deliberately omitted. These tests yielded pressures lower than those of the reduced charge tests. No adverse effects were noted.

In addition to the high temperature tests, 55 ambient temperature tests were conducted. Fourteen of these were of the full charge with instrumentation, and 12 were of the reduced charge with instrumentation. Twenty-four ambient temperature tests were conducted with instrumented couplings of which ten were full charge, ten were reduced charge, and four were deliberately unbalanced charges.

Tests of the LAW LSS firing unit's compatibility with the modified M190 launcher were conducted in various ways. The effective recoil momentum was measured in pendulum tests with full charges, reduced charges, and deliberately unbalanced charges. In most of these tests, movement of the pendulum was slight enough to be negligible, indicating virtually no effective recoil momentum. Over all the tests, including those with deliberately unbalanced charges, maximum momentums of

0.63 and 0.42 lb-sec were observed in the forward direction. Although tests of the M73 indicated momentum in the area of 0.10 lb-sec; these were all very small values. It should be noted that the allowable momentum of the Dragon Missile is about 3 lb-sec. It was, therefore, concluded that even if improperly loaded, the LAW LSS had a very low effective momentum, well within acceptable and safe momentum limits. Three tests were conducted in which the locking pin was deliberately omitted from the assembly. No adverse effect was noted, indicating the inherent safety of the system.

Measurements were made of the sound pressure of the LAW LSS under a variety of conditions. Both full charge and reduced charge units were tested in the modified M190 launcher. The average maximum sound level, at the position of the firer's head, was measured at 166 peak dB for the full charge and 161 peak dB for the reduced charge. Measurements were made of the equivalent sound level of the M73 under similar conditions. The average maximum value measured was 164 peak dB. However, the full charge LAW LSS was considered safe for field use when compared with the sound level of the Dragon Missile, which was about 174 peak dB, and the M72 LAW, which was about 169 peak dB.

ECONOMIC CONSIDERATIONS

The LAW launch signature simulator was assembled from components of existing M73 subcaliber practice rockets with the addition of a central coupling and three clips. Since the M73 rocket was not currently in production, the necessary individual components could only be obtained by cannibalizing rockets from the available stockpile or by new procurement. For the purpose of the TISE program, with its extremely tight schedule and relatively small number of required rounds, there was no choice but to cannibalize readily available rockets.

Because of the tight schedule, the coupling is designed to far exceed the strength requirements for normal safety considerations. As a result, the coupling is capable of being reused many times. The test program at ARRADCOM determined that a given coupling could be reused at least five times with no evidence of deterioration. Therefore, if additional small quantities of LAW LSS firings should be required, the existing couplings can be used to support the program, eliminating the cost of procuring new ones. It will only be necessary to procure additional clips and plastic plugs. Tooling to fabricate these parts is in existence. Sufficient quantities of M73 rockets are available in stock to support such programs.

If a large number of LAW LSS units of the existing design should be required in a time frame that permits procurement of all components, it may be most economical to procure components more specifically adapted to the LSS design than are some of the M73 components. This would eliminate the waste of performing a disassembly operation on the complete rocket and discarding the forward end components. The assembly of the quick-match tube and primer block can be eliminated from half the motor tube-igniter assemblies. A simpler support system can replace the complex fin assembly on all motor tubes. Assembly and packing can be performed in a loading plant, eliminating the engineering support now necessary to prepare firing units.

Experience shows that anywhere from 1 to 100 rounds of the M73 practice rocket may be fired with a given M190 launcher before it breaks down, depending on whether or not it is carefully handled by the troops. The firing mechanism is most frequently broken by mishandling during cocking. The modified M190 launcher is subject to the same liability to damage.

During the TISE program, it was possible to replace the portion of the launcher containing the firing mechanism with the corresponding portion of a discarded LAW launcher. The primer block door and lock pin assembly had to be transferred from the damaged part, but no other modifications were necessary, other than to stencil the LAW LSS launcher identification onto the replaced part. Twenty-two modified M190 launchers were provided together with 19 replacement portions of discarded LAW launchers prestencilled to identify the LAW LSS launcher. No special efforts were made to preserve the life of the launchers. Normal troop training techniques were used. During the program, 20 launchers were in use in the field at any given time. A total of 677 rounds were fired. Six launchers had to be refurbished with replacement parts during the program. Twenty-one launchers in good operating order are still available. This experience was considered typical of hard troop usage, which may be improved by more careful troop indoctrination and/or special precautions to extend launcher life.

When planning large scale programs it is necessary to take into account the availability of expended LAW launchers for conversion into modified M190 launchers and for spare parts, conversion kits to prepare M190 launchers, and the necessary modification operations and hardware. Plans should include precautions to preserve the life of launchers to the maximum extent possible.

FUTURE PLANS

The existing design of LAW LSS and its performance were dictated by the restraints of material availability and time. However, there is no reason why the basic concept of the signature simulator cannot be more freely applied to simplify the design and make it more economical to produce, or to modify the signature if desired.

Future plans for deployment of signature simulators for small rocket and missile systems, including others besides LAW, should be examined to determine whether the output of the existing LAW LSS would be satisfactory to meet their requirements. Alternatively, a modification of its output might be desirable to permit a whole family of small rocket systems to be simulated with the same basic device. The family of weapons to be simulated might also include foreign weapons of interest.

Such a system can be designed to provide an inexpensive, one-shot, throwaway, type-classified, shelf item for operational exercises, training, decoys, or any other application requiring highly realistic simulation of a missile firing without presenting a downrange hazard.

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